# USSR.

Temperature of vitrification and fluidity of natural rubbers of different molecular weights. A. Tager, M. Iovleva, T. Kantor, and L. Muzheva. Zhur. Priklad. Khim. 27, 1227–30(1954).—The mol. wt. of natural rubbers milled for different periods was detd. from the reduced viscosity-concn. plots by the relation $[\eta] = KM^a$, where $[\eta]$ is the intrinsic viscosity, $K$ and $a$ are consts., and $M$ is the mol. wt. From the degree of deformation as a function of the temp., detd. by the method of Kargin, et al. (C.A. 43, 7294f), it was shown that the mol. wt. affected the temp. of the initial fluidity but not that of vitrification.    I. Bencowitz

Chemistry - Elastomers                                            FD-2525

            Pub. 50 - 4/14

    :   Tager, A. A. Cand Chem Sci; Gordeyeva, T. B., Karlinskaya,
        D. Yu., Kurochkina, L. M.

    :   Methods of evaluating some technological properties of sodium
        butadiene rubbers

diced    :   Khim. prom. No 4, 209-213, Jun 1955

uct      :   Describe the method of "foaming" and the method of thermomechanical
             curves, which can be used in evaluating the capacity of rubbers to
             form a tridimensinal structural network.  Ten references, all of
             them USSR, 8 since 1940.  Three graphs, 2 tables.

tions :   Ural State University; Sverdlovsk Ebonite Products Plant

Thermodynamic study of copolymer solutions. I. Thermodynamic study of solutions of butadiene-styrene copolymers. A. A. Tager, L. K. Kosova, D. Yu. Karlinskaya, and I. A. Yushe (A. M. Gor'kii Ural State Univ., Sverdlovsk). Kolloid. Zhur. 17, 315-23(1955); cf. C.A. 47, 4696e.—The integral heats $Q$ of soln. of copolymers in $C_4H_6$ were equal to those of swelling, i.e. the heats of diln. were very small. The $Q$ was immeasurably small for co-polymers contg. 60 or 70 wt. % styrene; it was pos. when the fraction $x$ of styrene was greater and increased with $x$, and was more neg. the smaller was $x$ between $x = 10$ and $50\%$; e.g. at $x = 10\%$, $Q = -1.18$ cal. for 1 g. copolymer. Sorption $a$ of $C_4H_6$ vapor by copolymers, up to the relative vapor pressure $p/p_0$ of 0.5, was greater the smaller was $x$; at higher $p/p_0$ some curves of $a$ vs. $p/p_0$ crossed. Computation of these data showed that penetration of $C_4H_6$ into copolymers with $x < 90\%$ was assocd. with an increase in entropy $S$ (because of the flexibility of the polymer chains) while $S$ of the rigid copolymer with $x = 90\%$ decreased, and that copolymers with a small $x$ dissolved in $C_4H_6$ as a result of diffusion while those with a large $x$ dissolved because of an interaction between copolymer chains and $C_4H_6$.

J. J. Bikerman

lager, H.H.

Thermodynamic study of copolymer solutions. II. Thermodynamic study of solutions of copolymers of butadiene and acrylonitrile. A. A. Tager and L. K. Kosova (A. M. Gor'kii Ural State Univ., Sverdlovsk). *Kolloid Zhur.* 17, 391-6(1955); cf. *C.A.* 49, 15128e.—Copolymers contg. 18 (I), 26 (II), and 40 wt. % (III) acrylonitrile, and polyacrylonitrile (IV) were studied. The heat of soln. (or swelling) in $C_6H_6$ was zero for I and IV, 0.45 for II, and 0.70 cal./g. polymer for III. The sorption of $C_6H_6$ vapor increased in the series IV < III < I < II; e.g. at relative vapor pressure of 0.5, 1 g. of II took up 0.3 g. $C_6H_6$. From these data the enthalpy, free energy, and entropy of the systems were calcd. As penetration of $C_6H_6$ into the polymers was assocd. with an entropy increase, the polymer chains must be flexible. The affinity of $C_6H_6$ for the polymers was detd. by this flexibility and the ratio of the polarities of polymer and solvent. The temp. below which the "glassy state" appeared was −45 to −55° for I, −36 to −45° for II, and −20 to −27° for III. The heat of soln. of IV in $HCONMe_2$ was 5.2 cal./g. polymer.

J. J. Bikerman

TAGER, A.A.

M, A, YOUTZ
2 copies

✓ Effect of chemical structure of butadiene–styrene copolymers on their transformation temperatures. A. A. Tager and I. A. Yurina (Zh. prikl. Khim., 1955, 28, 1327—1331). — The vitrification temp. of styrene–butadiene copolymers falls regularly with rising butadiene content, from 10 to 90%, and of polyacrylic esters $[\cdot CH_2 \cdot CH(CO_2R) \cdot]_n$ with increase in mol. wt. of R. The temp. at which fluid flow begins falls steadily as the styrene content rises from 10 to 60%, changing little thereafter; that for $[\cdot CH_2 \cdot CH(CO_2R) \cdot]_n$ varies in the order $R = Me \gg Et > Bu$.

R. TRUSCOE.

Tager, A.A.

The effect of the molecular weight of polystyrene on the packing density of the molecular chain. T. V. Gatovskaya, V. A. Kargin, and A. A. Tager (L. Ya. Karpov Phys. Chem. Inst., Moscow). Zhur. Fiz. Khim. 29, 883-8 (1955). — The sorption isotherm of ethylbenzene by polystyrene samples over a wide variety of mol. wts., and the differential heat of mixing of these samples, were used in the calcn. of the partial specific entropy changes caused by mixing. The entropy changes $\Delta S_i = f(w_i)$ ($w_i$ is the polymer proportion) form curves having min., the values of which are less, the smaller is the mol. wt. The value of this min., combined with the effect and the sorption data, can be used to evaluate the packing d. of rigid chain mols.

— W. M. Sternberg

TAGER, A.A.

USSR/ Chemistry - Physical chemistry

Card    1/1        Pub. 22 - 35/60

Authors      :   Tager, A. A.; Krivokorytova, R. V.; and Khodorov, P. M.

Title        :   Heats of solution of polystyrenes of different molecular weight and the
                 packing density of stable chains

Periodical   :   Dok. AN SSSR  100/4, 741-743, Feb 1, 1955

Abstract     :   The integral heats of solution were determined for various fractions in
                 benzene and for a hydrogenated polysterene monomer - ethyl benzene. The
                 results indicate that polystyrene with a molecular weight of about 1000
                 dissolves in benzene and in ethyl benzene with a zero thermal effect. It
                 was observed that the low-molecular polystyrene dissolves in a natural
                 hydrogenated monomer - ethyl benzene - with a zero thermal effect which
                 indicates that the packing density of the low-molecular polystyrene is
                 close to the packing density of ethyl benzene molecules.  An increase in
                 molecular weight was observed to be followed by a considerable increase
                 in the heat of solution.  Four references: 3 USSR and 1 USA (1950-1954).
                 Table; graph.

Institution :   The A. M. Gorkiy Ural State University

Presented by:   Academician V. A. Kargin, August 17, 1954

Name: TAGER, Anna Aleksandrovna

Dissertation: Thermodynamic study of solutions of amorphous high-molecular compounds and structure of polymers

Degree: Doc Chem Sci

Affiliation: Ural State U imeni Gor'kiy

Defense Date, Place: 24 Dec 56, Council of Sci Res Phys-Chem Inst imeni Karpov

Certification Date: 21 Sep 57

Source: BMVO 22/57

AUTHORS:     Tager, A. A., Smirnova, A.,                SOV/156-58-1-35/40
             Sysuyeva, N.

TITLE:       The Density of Packing of Polymers and the Volume Change
             Connected With Their Dissolution (Plotnost' upakovki polimerov
             i izmeneniye ob"yema pri ikh rastvorenii)

PERIODICAL:  Nauchnyye doklady vysshey shkoly, Khimiya i khimicheskaya
             tekhnologiya, 1958, Nr 1, pp. 135 - 138 (USSR)

ABSTRACT:    The results obtained from the investigations of different
             properties of polymeric substances prove that - according to
             the chemical structure and the physical state - the polymers
             may have both a dense and a loose packing. It may be expected
             that the difference in the density of packing will act on the
             change of its volume connected with dissolution. In a general
             case the change of volume connected with the mixing of two
             components may be attributed to 3 causes: 1) to the difference
             of the energies of interaction in an isolated state and in
             the mixture, 2) to the difference between the molecular size
             of the components and 3) to the difference in the densities of
             packing of the molecules. In order to eliminate the first
             factor, it is advisable to investigate the change of volume

Card 1/4

The Density of Packing of Polymers and the Volume          SOV/156-5-1-37/4.
Change Connected With Their Dissolution

taking place with the mixing of components which have a similar
chemical structure. If the liquids are related also with
respect to the factors 2) and 3), no change of volume must take
place at mixing. The authors selected 2 polymers which are
different both with respect to their chemical structure and to
their physical state: poly-isobutylene and polystyrene. In
order to eliminate the influence exercised by the chemical
structure of the solvent, such solvents were selected which
are closely related to the polymer: ethyl-benzene for poly-
styrene and n-heptane for poly-isobutylene. The results
obtained are shown in figure 1. It hence results that in the
polystyrene-ethyl-benzene system a greater compression is
observed than in the poly-isobutylene-isooctane system. It
results from figure 2 that a considerable compression takes
place in the polystyrene-benzene- and polystyrene-toluene
systems. An analogous picture is found in the polystyrene-
cyclo-hexanon system. In connection with this, the compression
in the poly-isobutylene-benzene and poly-isobutylene-toluene
systems is as small as in the poly-isobutylene-n-heptane
Card 2/4          systems (Fig 3). These data show clearly that in connection

The Density of Packing of Polymers and the Volume          SOV/156-58-1-37/46
Change Connected With Their Dissolution

with the dissolution of a loosely packed polymer a greater
compression takes place than with the dissolution of a densely
packed polymer. Figure 4 shows data for a series of co-polymers
of butadiene and styrene. Benzene was used as solvent. In
connection with the dissolution of a co-polymer with 50% styrene-
members a strong compression takes place which indicates a
loose packing of this polymer. The compression decreases as
the increasing number of the butadiene-members in the macro-
molecule. This signifies that the density of co-polymers in-
creases as the decrease of the phenyl substituents. There are
4 figures and 5 references, 2 of which are Soviet.

ASSOCIATION:   Kafedra fizicheskoy khimii Ural'skogo gosudarstvennogo universi-
teta im.A.M.Gor'kogo (Chair of Physical Chemistry at the Ural
State University imeni A.M.Gor'kiy)

SUBMITTED:     October 16, 1957

Card 3/4

The Density of Packing of Polymers and the Volume
C.. ... Connected With Their Dissolution                    SOV/156-58-1-33,

C... 4/4

AUTHORS:    Tager, A. A., Galkina, L A                    SOV/156-58-2-39/48

TITLE:      The Thermodynamic Investigation of the Solution Process of
            Polystyrene in Methyl-Ethyl Ketone and Ethylacetate (Termo-
            dinamicheskoye issledovaniye protsessa rastvoreniya polistirola
            v metiletilketone i etilatsetate)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Khimiya i khimicheskaya
            tekhnologiya, 1958, Nr 2, pp. 357 - 360 (USSR)

ABSTRACT:   The experimental results concerning the solution of poly-
            styrene in benzene (Ref 1) and ethyl-benzene (Ref 2) give
            evidence of laws which differ basically from those concerning
            the elastic polymers. The most important difference is the
            modification of the entropy of the solvent. The penetration
            of the benzene- or ethyl-benzene molecules into the range
            of the polystyrene macromolecule is accompanied by an
            abrupt decrease of the entropy. In contrast to this the
            increase of the solvent entropy is characteristic of the
            dissolution of the elastic polymers which are in an elastic
            state (the mixture entropy is high). An attempt to explain
            the causes to which this law is due was interesting: it is
Card 1/3     either the nature of the polymer or that of the solvent.

The Thermodynamic Investigation of the Solution          SOV/156-58-2-39/48
Process of Polystyrene in Methyl-Ethyl Ketone and Ethylacetate

Therefore the investigation mentioned in the title was
carried out. The two mentioned liquids dissolve polystyrene
(molecular weight 142000) to a different extent: it is well
soluble in methyl-ethyl ketone, whereas ethyl-acetate causes
only a swelling of polystyrene. Sorption isothermal lines
(fig 1) of both liquids by polystyrene were determined
by means of earlier described methods (Ref 1) and the heat
of solvation was determined. Figure 1 shows that methyl-ethyl-
ketone is sorbed by polystyrene in greater quantities than
ethyl-acetate. On the strength of these results the authors
draw the following conclusions: the character of the observed
laws does not depend on the nature of the low-molecular
liquid. They are determined only by the nature of the poly-
styrene. An abrupt decrease of the entropy of the low-
molecular liquid which takes place in the case of penetration
of the latter into the polystyrene phase may be explained
by a loose packing of the polystyrene macromolecules and by
the formation of orientated adsorption layers of the low-
Card 2/3          molecular liquid in the micropores of this polymeric sorbent.

The Thermodynamic Investigation of the Solution
Process of Polystyrene in Methyl-Ethyl Ketone and Ethylacetate              SOV/156-58-2-39/48

There are 4 figures and 5 references, 4 of which are Soviet.

ASSOCIATION:  Kafedra fizicheskoy khimii Ural'skogo gosudarstvennogo uni-
versiteta im.A.M.Gor'kogo ( Chair   of Physical Chemistry
of the Ural State University imeni A.M.Gor'kiy)

SUBMITTED:    November 27, 1957

Card 3/3

AUTHOR:        Tager, A.A. (Sverdlovsk)                         74-27-4-5/8

TITLE:         On a "Good" and a "Bad" Solvent of Polymers (O "khoroshem" i
               "plokhom" rastvoritele polimerov)

PERIODICAL:    Uspekhi Khimii, 1958, Vol. 27, Nr 4, pp. 481-487 (USSR)

ABSTRACT:      In publications dealing with this subject the expressions "good"
               and "bad" are frequently found in connection with solvents used
               for polymers. Also on the IX Conference for the Investigation of
               Compounds of High Molecular Weight there was much that needed
               explaining in this respect. The present paper subjects this prob-
               lem to a thorough investigation. As, by the addition of a precip-
               itating agent, the solubility of the medium can be reduced, gen-
               eralizing conclusions were drawn from this fact: A solvent is de-
               scribed as "bad" if the viscosity of the solution is inferior to
               that of a "good" solvent. This gives rise to the question as to
               what, with respect to energetics, may be looked upon more or less
               as a good solvent. In the present paper the works by **Frith and
               Spurlin** (Refs 6,7), Pakshver, Kakhomskaya and Dolinin (Ref 9)
               and Sherman, Kozlov (Ref 10) are discussed for the purpose of
Card 1/2       finding an answer to this question. In the works mentioned it is

proved that if methanol and butanol are added, viscosity is very slightly reduced in the methylene chloride. Great interest was caused by the works by Kargin, Mirline and Bakeyev (Ref 19) which deal with structural formation in dependence on the shape of the chains in polyelectrolyte solutions. In this connection the author is of the opinion that a final and definite explanation depends in a high degree on what is required in practice (with respect to solvents). In any case it can be said that a good solvent for any kind of polymer is one in the case of which the polymer forms a thermodynamic system. With decreasing solubility the absolute value $\Delta \mu_1$ is reduced and in connection herewith also the clearness and transparency of the solution. As regards the viscosity of the solution it was shown that this problem is connected with the elasticity of the chains. In the solutions of elastic polymers viscosity in a good solvent is greater than in a bad one. In the solutions of rigid polymers viscosity, in the case of a good solvent, can be greater and weaker than in a bad one. In the case of polymers with stepped degrees of elasticity of the chains there may be no correlation between elasticity and solubility of the solvent. There are 19 references, 11 of which are Soviet.

1. Organic solvents--Chemical properties

Card 2/2

AUTHORS:    Tager, A. A., Kargin, V. A.    76-32-6-26/46

TITLE:    Thermodynamic Investigation of the System Polymer-Hydrated Mono-
mer (Termodinamicheskoye issledovaniye sistemy polimer-gidriro-
vannyy monomer)II. The Solution Heat of Copolymers in the
Mixture of Hydrated Monomers (II. Teploty rastvoreniya sopolimerov
v smesi gidrirovannykh monomerov)

PERIODICAL:    Zhurnal fizicheskoy khimii, 1958, Vol. 32, Nr 6,
pp. 1362 - 1366 (USSR)

ABSTRACT:    The present paper investigates copolymers of butadiene and
styrene as well as saponified polyvinylacetates at different
degrees of saponification. M.Iovleva and Yu.Treskunova took
part in the experimental part of the work. The types of butadiene-
- and styrene copolymers (their brand names being mentioned) to
be investigated were supplied by the All Union Scientific Research
Institute for Synthetic Rubbers. The polyvinylacetate was corre-
spondingly saponified. A mixture of ethylbenzene and isooctane
at a ratio corresponding to the composition of the copolymer was
used as calorimetric liquid. From the experimental results
shown in tables it may be seen that a higher content of butadiene
Card 1/3    (the types CKC 1o, CKC 3o) causes a heat absorption in the

Thermodynamic Investigation of the System Polymer-    76-32-6-26/46
-Hydrated Monomer. II. The Solution Heat of Copolymers in the Mixture of
Hydrated Monomers

solution of the mixture of the corresponding hydrated monomers,
while the increase of the amount of phenyl substituents shows
a higher value of the solution heat. In classifying the obtained
results the authors mention that an increase of the number of
substituents causes a loosening of the molecular packing while
in the presence of polar OH-groups no such loosening is noticed.
The use of hydrogen bindings in polyvinyl alcohol was proved
by S.N.Zhurkov and B.Ya.Levin (Ref 6), however, the heat ab-
sorption in the system polyvinyl alcohol-ethanol can not be
fully explained, as there are two possibilities for it. Among
other facts the investigations showed that at the transition
from the polymer with mobile chains to one with fixed chains
a continuous change of all thermodynamic properties of the
solutions takes place. An additivity of the change of the mobil-
ity and density of the packing was found only within the range
of from 2o to 7o% butadiene, as, e.g. the introduction of 1o%
butadiene into the polystyrene chain changes these properties
to a great extent; this agrees to the data obtained by A.I.

Card 2/3        Marey and M.Z.Al'tshuller (Ref 8). There are 2 figures, 3 tables,

Thermodynamic Investigation of the System Polymer-       76-32-6-26/46
-Hydrated Monomer. II. The Solution Heat of Copolymers in the Mixture of
Hydrated Monomers

              and 8 references,      which are Soviet.

ASSOCIATION:  Vsesoyuznyy institut sinteticheskogo kauchuka, Ural'skiy gosu-
              darstvennyy universitet im.A.M.Gor'kogo, Sverdlovsk (Sverdlovsk,
              All-Union Institute of Synthetic Rubber, Ural State University
              imeni A.M.Gor'kiy)

SUBMITTED:    February 18, 1957


              1. Polymers--Heat of solution


Card 3/3

AUTHOR:    Tager, A. A., Iovleva, M.

SOV/76-32-8-8/57

TITLE:   -   Thermodynamic investigations of Copolymer Solutions
(Termodinamicheskiye issledovaniya rastvorov sopolimerov
III. Saponified Polyvinyl Acetates (III. Omylennyye
polivinilatsetaty)

PERIODICAL:   Zhurnal fizicheskoy khimii, 1958, Vol. 32, Nr 8.
pp. 1771-1774 (USSR)

ABSTRACT:   For investigating the copolymer solutions containing groups
with a different degree of polarity in their chains the above
mentioned compounds were selected. They will not be obtained
by copolymerization, they may, however, to a certain extent
regarded as copolymers of vinyl alcohol and vinyl acetate.
The saponification was carried out according to instructions
by Professor I. I. Cotton. The calculation of the molecular
weight of the saponification products according to Gerbil'skiy
(ref.?) similar the value 114 000, and according to another
equation (41) it was observed that the products with a
higher acetyl number are well soluble in acetone, while those
of a lower (9%) number are not soluble and also do not swell.

Card 1/2

Homologues in investigations of Copolymer                    SOV/76-32-8-8/31
Solution. II. Saponified Polyvinyl Acetates

...e...t of the interaction of the saponification products
...th acetone decreases according to the increase of the num-
...r of hydroxyl groups. Determinations of the sorption iso-
...herms. These were carried out and are represented graphical-
ly. From the experimental results obtained may be seen that
polyvinyl acetate as elastic chains and a dense packing. The
elasticity of the chain decreases and the density of the pack-
ing increases at an increase in the number of the OH groups.
The experimental results may explain the data by V.S.
Mitzentov, V.A. Kargin and A.I. Kitaygorodskiy (Ref 10); they
agree with those by ... Kargin ... Ya. Petrov (Ref 12) as
... ... istler and ... ... ...).
Th... ... figures, ... ... ... references, **all of which**
...

... ...: Ir... ... rosularity ... university im. A.M. Gor'kogo
Card 2/2           V. ... Wien State University imeni A.M. Gor'kiy,

SUBMITTED :      February 18, 1957

AUTHORS:    Tager, A. A., Gur'yanova, V. V.                SOV/76-32-9-4/44

TITLE:      The Temperature Dependence of the Heat of **Solution**    and the
            Packing of Polymer Molecules in Various Physical States
            (Teploty rastvoreniya i upakovka molekul polimerov v raznykh
            fizicheskikh sostoyaniyakh)

ABSTRACT:   The authors studied the total heat of    solution of poly-
            styrene with a molecular weight of 327,000. The solvents
            used were ethyl benzene and toluene. The determinations were
            carried out using a calorimeter and at temperatures between
            $-13°$ and $+113°$. The heat of    solution decreases with
            increasing temperature and becomes zero at $70°$ (Fig 1).
            The value of $T\Delta \overline{S}_1$ for the system polystyrene-toluene at $70°$
            was calculated; in figure 2 the curve for this system
            is compared to the curve for the polystyrene-benzene system
            at $25°$ (Ref 3). The curve at $70°$ corresponds to the curve
            for flexible polymers. With a temperature increase the
            relaxation time decreases, the flexibility of the poly-
Card 1/2     styrene chains improves, and consequently the packing of the

The Temperature Dependence of the Heat of Solution        SOV/76-32-9-4/46
and the Packing of Polymer Molecules in Various Physical States

chains becomes closer. There are 2 figures and 16 references, 12 of which are Soviet.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet, Sverdlovsk (Sverdlovsk, Ural State University)

SUBMITTED:  February 18, 1957

Card 2/2

5(4)
AUTHORS:    Tager, A. A., Kargin, V. A.                    SOV/76-32-12-7/32

TITLE:    The Solution Heat of Polymers and Their Hydrogenated
Monomers in the Same Liquid (Teplota rastvoreniya polimerov
i ikh gidrovannykh monomerov v odnoy i toy zhe zhidkosti)

PERIODICAL:    Zhurnal fizicheskoy khimii, 1958, Vol 32, Nr 12,
pp 2694 - 2701 (USSR)

ABSTRACT:    Four cases are to be distinguished: 1) both the hydrated
monomer and the polymer are amorphous; 2) the monomer is
crystalline, the polymer amorphous; 3) the monomer is
amorphous, the polymer crystalline; 4) both are crystalline.
The present paper investigates only cases 1 and 2. Case 1:
Test results show that the two solution heats are never equal.
Two types of bindings are represented in the polymer:a) a
large number of molecules is chemically combined in a polymer
chain, b) between the chain there are much weaker intermole-
cular forces. Whereas in the hydrogenated monomer all mole-
cules separate and mix with the molecules of the solvent,
the polymeric chains remain combined and only the intermole-
cular forces must be overcome by the solution. Thus, the

Card 1/3

The Solution Heat of polymers and Their Hydrogenated    SOV/70-32-12-7/32
Monomers in the Same Liquid

energy demand for the dissolution of polymers ought to be
less than in the case of monomers. In this case, however,
a correction is necessary because of the packing density
of the polymer. a: The polymer packing is as dense as that
of the monomer. In this case the above mentioned divergency
was measured ($E_{polym} < E_{monom}$). B. The polymer packing is looser
than that of the monomer. In this case less energy is re-
uired for the dissolution of the polymer and the divergency
becomes even greater ($E_{vol \, m} < E_{monom}$). - C. The polymer
packing is denser than that of the monomer. In this case
the intermolecular forces of the polymer can become so
strong that more energy is required to dissolve the polymer
than the monomer ($E_{polym} > E_{monom}$). Case 2: The same con-
siderations apply. The polymer chains do not dissolve but
the molecules of the monomer have yet to be extracted from
their crystal lattice. Thus: $E_{polym. am-orph} < E_{monom.crystall}$.
also the effect of the crystal structure is shown, for
example, by the energy difference in the dissolution of

Card 2/3

The Solution Heat of Polymers and Their Hydrogenated     SOV/76-32-12-7/32
Monomers in the Same Liquid

crystalline or glassy glucose. The energy difference is due
to the crystallization heat. This disproves other theories
(Refs 1,2, and 3). There are 2 tables and 9 references, 0
of which are Soviet.

ASSOCIATION:   Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo,
               Sverdlovsk (Ural State University imeni A. M. Gor'kiy,
               Sverdlovsk)

SUBMITTED:     July 6, 1957

Card 3/3

SOV/20-120-3-37/67

AUTHORS:  Puzer, M. M., Tsilirotkina. M. V., Suvorova, A. I.

TITLE:  The Determination of the Specific Surface and the Volume
of the Pores of Solid Polymeric Sorbents (Opredeleniye
udel'noy poverkhnosti i ob"yema por tverdykh polimernykh
sorbentov)

PERIODICAL:  Doklady Akademii Nauk SSSR, 1956, Vol. 110, Nr 3, pp.570-572
(USSR)

ABSTRACT  Results hitherto obtained in this field indicate the necessi-
ty of a new form of studying the processes of the inter-
action between high-molecular glasses and solvents. This new
process might also be suited for polymers in a vitreous state
as also for solid sorbents. One of these methods, which, by
the way, is being widely used, is the sorption method. How-
ever, the hitherto obtained isothermal lines of sorption do
not furnish any unique data concerning the porosity of the
polymers. The causes of this lack of uniqueness are mentioned.
This ambiguity can be avoided by using a liquid that is
inert with respect to the given vitreous polymer. The structure
of the polymer then does not change during the process of

Card  1/4

SOV/2o-12o-5-37/67

The Determination of the Specific Surface and the Volume of the Pores of
Solid Polymeric Sorbents

sorption, and the flexibility of the chain is not realized.
The authors investigated the sorption of the vapors of inert
liquids by polystyrene, polyvinyl alcohol, cellulose, and
by triacetyl cellulose. Two sorbents of polystyrene with the
molecular weights of 456000 and 133000 respectively, pul-
verulent triacetyl-cellulose with the molecular weight
40000, polyvinyl alcohol with the molecular weight 17000 and
industrial linters were used as sorbents. As inert liquids
methyl-alcohol was used for polystyrene and x-hexane was
used for the other polymers. The apparatus used for these
investigations has already been described (Ref 1). The results
obtained by measurements are given in form of 2 diagrams.
The isothermal lines of the sorption of methyl alcohol on
polystyrene and x-hexane on cellulose are similar to the iso-
thermal lines of the vapors of the same liquids on silica
gel. Various details are mentioned. The course taken by the
isothermal line of the sorption of the sample with the mole-
cular weight 133000 is lower than that of the sample having
the molecular weight 456000. This indicates an increasing
loosening which takes place with a rising molecular weight

Card 2/4

The Determination of the specific Surface and the Volume of the Pores of solid Polymeric Sorbents

of the polystyrene. A table contains the calculated values of the specific surface and the volumes of the pores for the polymers investigated. High-molecular polystyrene, cellulose, and triacetyl cellulose may be classed among the finely porous sorbents having a little-developed specific surface. With a reduction of the molecular weight of the polystyrene the specific surface and the volume of the pores diminish. The specific surface of the polyvinyl alcohol is very low. The results obtained indicate the possibility of a quantitative estimation of the porosity of polymers by investigating the inert liquids on them. There are 2 figures, a table and 15 references, 11 of which are Soviet.

Card 4/1

SOV/20-120-5-57/67

The Determination of the Specific Surface and the Volume of the Pores of
Solid Polymeric Sorbents

1. Polymers--Absorptive properties   2. Polymers--Adsorptive properties
3. Polymers--Porosity

Card 4/4

TAGER, A.A.

Effect of the molecular weight of some vitreous polymers in their integral heats of solution. Vysokom.soed. 1  no.1:21-28  Ja  '59.
(MIRA 12:9)

1. Ural'skiy gosudarstvennyy universitet im. A.M.Gor'kogo.
(Heat of solution)  (Molecular weight)  (Polymers)

TAGER, A.A.; BOCHKAREVA, A.P.; DVORETSKAYA, N.M.

Investigating the hardening of silicon organic resins. Part 1:
Hardening of resins prepared by the hydrolysis and condensation
of tetraethoxysilane. Vysokom.soed. 1 no.4:511-517 Ap '59.
(MIRA 12:9)

1. Ural'skiy gosudarstvennyy universitet.
          (Resins, Synthetic) (Ethyl silicates)

T___r, ._ __., Tsilipotkina, M. V., Doronina, V. M.

SOV/76-33-2-16/45

The Effect of the Molecular Weight  of Vitreous Polymers on the Packing Density of Their Chains (Vliyaniye molekulyarnogo vesa stekloobraznykh polimerov na plotnost' upakovki ikh tsepey). II. Polymethyl Methacrylates (II. Polimetil-metakrilaty)

Thermal fiziсheskoy khimii, 1959, Vol 33, Nr 2, pp ___ - 341 (USSR)

An estimate of the packing density of polymer chains can be obtained by a determination of the heat of solution (HS) and the sorption isotherms (Refs 1-3), as well as from the change in entropy (E) of the solvent (Refs 4,5). In this way the packing of polystyrene (Refs 1-4), cellulose (Ref 6), and polyvinyl alcohol (Refs 5,7) were determined. The data on the integral HS of polymethyl methacrylates (I) show (Ref 10) that an increase of the molecular weight to  M= 10000 leads to a loosening which varies slowly but continuously with further increase in M. For this reason three samples of ... were taken; sample 1 with M= 1-3.06.10⁶; sample 2 with

... ... Weight of Vitreous Polymers    SOV/74-57-2-16 45
... of their Chains. II, polymethyl Methacrylates

$= 2.4 \cdot 10^5$; and sample 3 with $M= '932$. The preparation of
the samples has been described previously (Ref 10). Sorption
isotherms of dichloroethane (II) and methyl isobutyrate (III)
on (I) were investigated, and the (HS) of (I) in (II)
(Fig 1.2) was determined; from the data obtained values for
$\Delta u_1$, $\Delta H_1$, and $\Delta \bar{S}_1$ were calculated. It was found that (II)
is more closely related to (I) than is (III). The sorption
isotherms (Fig 5) of (II) on 3 samples of (I) give a picture
analogous to that of polystyrene of various molecular weights.
The function curves of the (HS) (Fig 5) of the solvent-
composition show that with an increase in M the (HS) be-
comes positive. The marked decrease in the (M) of the
solvent in sorption on the samples with high M cannot be
explained only by the orientation of the solvent molecules
on the groups of the polymer. This observation (Fig 7)
is explained by a loose packing of very long, rigid chains
which require a longer time for "consolidation". The looser
packing of the polymer evidences a relaxation. With the increase
in the M of the vitreous polymer the packing loosens and

Card 2/3

Effect of the Molecular Weight of Vitreous Polymers   SOV/74-33-2-10/15
[...] the [...]ity of Their [...]. II. Poly-ethyl Methacrylates

thus increases the sorptivity, which occurs with an increased
heat effect and a decrease in (E). The analogy between
loosely-packed, high-molecular weight glasses and solid
porous colloidal sorbents is only valid during the beginning
state of the sorption. There are 7 figures and 18 references,
[...] of which are Soviet.

ASSOCIATION:   Ural'skiy gosudarstvennyy universitet im. Gor'kogo, Sverdlovsk
(Ural State University imeni Gor'kiy, Sverdlovsk)

SUBMITTED:   July 8, 1957

Card 7/8

5(4)

AUTHORS:     Tager, A. A., Tsilipotkina, M. V.,          SOV/20-124-1-37/69
Suvorova, A. I.

TITLE:       The Influence of Annealing on the Density of the Packing
             of Polystyrene (Vliyaniye otzhiga na plotnost' upakovki polistirola)

ABSTRACT:    The authors investigated the influence of long annealing upon
             the sorption capacity of polystyrene. Annealing was carried
             out by slowly and gradually cooling a polystyrene sample,
             which had previously been heated up to +140°, for about one
             day. The experiment was carried out with an air-thermostat
             fitted with a relay and a contact thermometer. Cooling from
             +140° to +20° lasted one month. By keeping the polystyrene at
             rather high temperatures (more than 100°) for a long time
             destruction of the samples was caused. The viscosimetrically
             determined molecular weight of the annealed samples decreased
             from 456 000 to 110 000. As, however, the density of packing
             in polystyrene depends largely on its molecular weight, a
             direct comparison between the annealed sample with the
Card 1/3     original sample would be wrong. Therefore, a sample of

The Influence of Annealing on the Density of the      SOV/20-124-1-37/69
Packing of Polystyrene

annealed polystyrene and a fraction of not annealed
polystyrene of similar molecular weight was chosen for this
investigation. The authors on both samples investigated the
sorption of methyl alcohol vapors, i. e. of a substance which
is inert with respect to polystyrene. The isothermal lines of
the sorption of methanol on the non-annealed sample has a
shape which, according to A. V. Kiselev's classification, is
characteristic of homogeneously fine-pored substances. The
isothermal lines of sorption on an annealed sample remind
of the isothermal lines of the sorption of poreless sorbents.
A table contains the values of the specific surface and the
volumina of pores. In the case of annealing during a very
long time, the packing of molecules becomes considerably more
dense, which is characterized by a reduction of pore volume
and of the specific surface by 50%. This result proves the
relaxation character of the looseness of the packing of
high-molecular polystyrene.  There are 1 figure, 1 table, and
9 references, 7 of which are Soviet.

Card 2/3

The Influence of Annealing on the Density of the          SOV/20-124-1-37/69
Packing of Polystyrene

ASSOCIATION:   Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
               (Ural State University imeni A. M. Gor'kiy)

PRESENTED:     August 7, 1958, by V. A. Kargin, Academician

SUBMITTED:     August 6, 1958

Card 3/3

TAGER, A.A.

Porosity of ion-exchange resins. Vysokom.soed. 2 no.7:994-996
Jl '60.                                          (MIRA 13:8)

1. Ural'skiy gosudarstvennyy universitet im. A.M.Gor'kogo.
     (Porosity)                              (Sorbents)

TAGER, A.A.; PASHKOV, A.B.; TSILIPOTKINA, M.V.; BYKOVA, N.I.

High sorptive capacity of ion-exchange resins.  Vysokom.soed. 2
no.7:997-1000  Jl  '60.                                (MIRA 13:8)

1. Ural'skiy gosudarstvennyy universitet im. A.M.Gor'kogo i
Nauchno-issledovatel'skiy institut plasticheskikh mass.
        (Adsorption)                    (Resins, Synthetic)

S/190/61/003/012/010/012
B110/B147

AUTHORS       Tager  A. A., Tsilipotkina. M. V., Romanova. D. M.

TITLE.        Estimation of packing density of chains of solid polymers.
              III.  Crystalline polymers

PERIODICAL.   Vysokomolekulyarnyye soyedineniya, v. 3: no. 12, 1961,
              1857 - 1859

TEXT.  The packing density of crystalline polymers (polyethylene (PE) and
polytetrafluoroethylene (PTFE)) and of the copolymer of 15% vinyl chloride
and vinylidene chlorite (saran) was examined. The sorption of inert
vapors of absolute $CH_3OH$ by PE and PTFE, and of $H_2O$ and cryoscopically
pure benzene by saran; was determined. Measurements were conducted at
$25^{\circ}C$ and $10^{-6}$ mm Hg. The sorption isotherms of $CH_3OH$ on PE and PTFE are
the same. In the low-pressure range (very dense packing) no sorption takes
place; at $p_1/p_1^0 = 0.55$. the branch of the isotherm sharply rises (sorption

Card 1/3

S/190/61/003/012/010/012
B110/B147

Estimation of packing density ...

of amorphous ranges) and sorption becomes constant. This phenomenon
neither corresponds to sorbents with ultramicropores, nor to such without
pores or with intermediate pores (S-shaped isotherms). It is caused by
the two phase structure of PE and PTFE. The sorption isotherms of $H_2O$
and $C_6H_6$ vapors on saran are similar to those of nonporous, rigid sorbents,
and of their packed glass-like polymers of the polyvinyl alcohol type. As
crystalline, microporous sorbents, such as zeolites, they sorb smaller $H_2O$
molecules more readily. As for active charcoal, cellulose, and polymer
fibers, also for saran, $p/p_0$ linearly depends on $(p/p_0)/[a(1-p/p_0)]$ in the
range of relative pressures of 0 - 0.5. The specific surface $S_{spec}$
= 23.4 $m^2/g$ calculated therefrom proves the absence of ultramicropores in
saran. The authors thank T. A. Soloboyeva for assistance with experiments.
A paper by M. M. Dubinin, Ye. D. Zaverina, and L. V. Radushkevich is
mentioned. There are 3 figures and 8 references: 7 Soviet and 1 non
Soviet. The reference to the English-language publication reads as

Card 2/3

Estimation of packing density ...

S/190/61/003/012/010/012
B110/B147

follow. I. W. Rowen. R.L. Blain. Industr. and Engng. Chem. 39 1659. 1947.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo (Ural State University imeni A. M. Gor'kiy)

SUBMITTED: January 19 1961

Card 3/3

TAGER, A.A.; TSILIPOTKINA, M.V.; Prinimala uchastiye: RAKOVA, G.M.

Evaluating the packing density of chains of solid polymers. Part 4: Isotactic polystyrene. Vysokom.soed. 3 no.12:1860-1862 D '61. (MIRA 15:3)

1. Ural'skiy gosudarstvennyy universitet imeni A.M.Gor'kogo.
                    (Polymers) (Styrene)

DREVAL, V.YE., TAGER, A.A.

Study of the rheological properties on concentrated solutions of welastic, glassy, and crystalline polymers as a function of concentration, temperature and type of solvent.

Report presented at the 13th Conference on high-molecular compounds, Moscow, 8-11 Oct 62

SUVOROVA, A.I., TAGER, A.A.

Effect of chemical structure and dimension of plasticizer molecules on the vitrification temperature of polymers.

Report presented at the 13th Conference on high-molecular compounds Moscow, 8-11 Oct 62

S/190/62/004/006/002/026
B101/B110

AUTHORS:     Mazur, A. A., Suvorova, A. I., Golayrev, L. N., Yesafov,
             V. I., Berestova, V. L.

TITLE:       Effect of the chemical structure of the plasticizer on the
             vitrification temperature of polymers. I. Plasticizing of
             polystyrene with diphenic acid and naphthalic acid esters

PERIODICAL:  Vysokomolekulyarnyye soyedineniya, v. 4, no. 6, 1962,
             805-808

TEXT:  Thermomechanical curves were plotted for polystyrene (PSt)
plasticized with 25 mole% of:  monomethyl-, monoethyl-, and monobutyl
diphenate; dimethyl-, diethyl-, ethyl-butyl-, dibutyl-, ethyl-octyl-, and
diheptyl diphenate; dimethyl, diethyl, and dibutyl naphthalate.  The
synthesis of ethyl-butyl diphenate (b.p. 167-168°C/15 mm Hg, MR 91.89)
and of ethyl-octyl diphenate (MR 110.57), now produced for the first time,
will be published.  The compatibility of the plasticizer with PSt was
studied on the basis of the critical mixing temperature, which lay at
100-130°C with diphenic acid monoester, below room temperature (sometimes

Card 1/2

Effect of the chemical structure ...

90/62/004/006/002/026
3101,3110

at ~ -50°C) with esters of this acid, and at room temperature with naphthalates. Points: (1) The vitrification temperature, $T_v$, of plasticized PSt drops with increasing compatibility. Pure PSt had $T_v = 100$°C, PSt with monoesters had $T_v = 40-70$°C, PSt with diphenic acid diesters yielded the lowest $T_v$. $T_v$ dropped with increasing length of the alkyl radical: ethyl-octyl diphenate yielded $T_v = -11$°C; the naphthenates showed a low effect ($T_v = 9-48$°C). (2) With increasing content of $CH_2$ links in the alkyl radical, $T_v$ of diphenic acid diesters approaches a minimum at $n_{CH_2} = 10-12$, and then rises again. (3) The structure of the aromatic radical of the plasticizer affects $T_v$: diphenates (and phthalates) plasticize more intensively than naphthalates. There are 3 figures and 2 tables.

ASSOCIATION:    Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
                (Ural State University imeni A. M. Gor'kiy)

SUBMITTED:      March 21, 1961

Card 2/2

S/020/62/144/003/028/036
B124/B101

AUTHORS:      Dubinin, M. A., Tsilipotkina, M. V., Romanova, G. M., and
              Dubinin, M. M., Academician

TITLE:        On microporous structure formation in the process of
              thermal degradation of Saran

PERIODICAL:   Akademiya nauk SSSR.  Doklady, v. 144, no. 3, 1962, 602-605

TEXT:  The microporosity of active carbons obtained in the course of the
thermal degradation of Saran (a copolymer of 85% vinylidene chloride and
15% vinyl chloride) was studied at temperatures between 170 and 700°C.
The weight loss of Saran on heating was assumed to be equal to the weight
of HCl evolved.  The nitrogen adsorption isotherms of the material
previously heated to various temperatures were measured at -195°C by a
volumetric method and those of benzene at 24°C by a gravimetric method.
The isotherms obtained for the products of thermally treated Saran are
typical of molecular-sieve-type, finely porous absorbents; the limiting
values of nitrogen adsorption for the sample C-700 (heated to 700°C)
being 3.6 times higher than those of benzene adsorption.  The structural

Card 1/2

On microporous structure ...

constants in the adsorption equation, namely the limiting adsorption space volumes $w_0$ giving the micropore volumes, and the constants B which depend on the size of the micropores were determined. (Table 2). Nitrogen with $\beta = 1$ was taken as the standard substance for the calculation of B. It is experimentally found that the evolution of hydrogen chloride in the initial stages of the thermal treatment leads to the formation of larger micropores as compared to those formed at higher temperatures. There are 5 figures and 2 tables.

ASSOCIATION:  Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED:  February 19, 1962

Table 1. Legend: (A) Sample;
(B) Nitrogen; (C) $w_0^A$, cm³/g;
(D) Benzene, $w_0^B$, cm³/g; (E) $w_0^B/w_0^A$.

| (A) Образец | Азот (B) $w_0^A$, cm³/г | B·10⁴ | (D) Бензол. $w_0^B$, см³/г | (E) $w_0^B/w_0^A$ |
|---|---|---|---|---|
| C | 0,00 | — | 0,00 | — |
| C-180 | 0,23 | 6,8 | 0,12 | 0,52 |
| C-350 | 0,34 | 7,0 | 0,14 | 0,41 |
| C-500 | 0,41 | 3,6 | 0,15 | 0,37 |
| C-700 | 0,46 | 3,4 | 0,27 | 0,59 |

Card 2/2

AUTHORS:     Tager, A. A., Suvorova, A. I., Goldyrev, L. N., Yesafov, V. I.,
             Gopius, ...

TITLE:       Effect of the chemical structure and the size of the
             plasticizer molecule on the vitrification temperature of
             polymers.  II.  Plasticizing of polymethyl methacrylate with
             esters of diphenic and naphthalic acids

PERIODICAL:  Vysokomolekulyarnyye soyedineniya, v. 4, no. 6, 1962, 609-614

TEXT:  Thermomechanical curves were plotted for polymethyl methacrylate
(PMMA) plasticized with 25 mole% of:  monomethyl, monobethyl, and monobutyl
diphenate; dimethyl, diethyl, ethyl-butyl, dibutyl, and diheptyl
diphenate; dimethyl, diethyl, and dibutyl naphthalate.  Results:  (1) The
better the compatibility between polymer and plasticizer, the greater the
drop in the vitrification temperature, $T_v$, of pure PMMA ($T_v = 100^{o}$C).
(2) $T_v$ dropped with increasing length of the alkyl radicals of the
diphenate down to a minimum ($-9^{o}$C).  (3) Monoesters of diphenic acid and
naphthalates showed a lower plasticizing effect ($T_v \sim 50^{o}$C).  (4) The
Card 1/2

Effect of the chemical structure ...

S/190/62/004/006/003/026
B101/B110

structure of the aromatic radical affects the plasticizing effect. The better plasticizing of diphenates is explained by the ability of the compound to be turned round the C-C bond between the two benzene rings. In the case of monoesters, the free COOH reduces the compatibility. (5) The molar concentration rule does not apply to the polymer plasticizer systems investigated. There are 5 figures and 1 table.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED:    March 21, 1961

Card 2/2

TSILIPOTKINA, M.V.; TAGER, A.A.; PETROV, B.S. [deceased];
      PUSTOBAYEVA, G.

      Evaluation of the packing density of solid polymer chains.
      Part 5: Determination of the specific surface area of polymers
      by means of nitrogen vapor sorption.  Vysokom. soed. 4
      no.12:1844-1850  D '62.                        (MIRA 15:12)

      1.  Ural'skiy gosudarstvennyy universitet imeni A.M. Gor'kogo.
            (Polymers)        (Nitrogen)         (Sorption)

TAGER, A.A.; TSILIPOTKINA, M.V.; ROMANOVA, D.M.; DUBININ, M.M., akademik;
    Prinimala uchastiye: MAMKINA, V.V.

    Formation of a microporous structure in the thermal decomposition
    of saran. Dokl.AN SSSR 144 no.3:602-605 My '62.    (MIRA 15:5)

    1. Ural'skiy gosudarstvennyy universitet im. A.M.Gor'kogo.
                    (Saran)    (Porosity)

TAGER, A.A.; DREVAL', V.Ye.

Viscosity and activation heats of concentrated polymer solutions as dependent on the concentration, temperature, and nature of the solvent. Dokl.AN SSSR 145 no.1:136-139 Jl '62.    (MIRA 15:7)

1. Ural'skiy gosudarstvennyy universitet imeni A.M.Gor'kogo. Predstavleno akademikom V.A.Karginym.
            (Polymers)    (Viscosity)    (Solvents)

TAGER, Anna Aleksandrovna. Prinimali uchastiye: TSVANKIN, D.Ya.;
BORISOVA, T.I.; BURSHTEYN, L.L.; SLINKIN, A.A.; DULOV, A.A.;
MIKHAYLOV, G.P., red.; BOGATLINA, A.A., red.; SHPAK, Ye.G.,
tekhn. red.

[Physical chemistry of polymers] Fiziko-khimiia polimerov.
Moskva, Goskhimizdat, 1963.  528 p.          (MIRA 16:12)
                    (Polymers)

S/190/63/005/001/012/020
B101/B186

AUTHORS:     Tager, A. A., Podlesnyak, A. I.

TITLE:       Concentrated polymer solutions. I. Determination of the
             integral and differential heats of solution and dilution of
             polyisobutylene and polystyrene

PERIODICAL:  Vysokomolekulyarnyye soyedineniya, v. 5, no. 1, 1963, 87 - 93

TEXT:  An improved calorimeter was designed, based on that suggested by
S. M. Skuratov (Kolloidn. zh., 9, 133, 1947). It allows of measuring small
heat effects during a prolonged time of reaction. The temperature was
measured by thermistors and the adiabatic conditions maintained by photo
relays. The sensitivity of the apparatus was 0.006 cal. The integral heat
of solution, $q$, was measured for polyisobutylene, molecular weight
$1.99 \cdot 10^6$, and polystyrene, molecular weight $4.13 \cdot 10^5$. The following was
found for $q$, cal/g polymer: polystyrene in ethyl benzene 5.76, in $CCl_4$
5.29; polyisobutylene in isooctane 0, in cyclohexane $-0.16$, in $CCl_4$ $-0.97$,
in toluene $-2.09$. The integral heat of dilution was determined by crushing

Card 1/3

S/190/63/005/001/012/020
B101/B186

Concentrated polymer...

an ampoule containing a solution of known concentration in 20 ml solvent.
Solutions with a concentration $w_2$, of 0.1 - 0.5 parts by weight of polymer
were diluted to $w_2$, 0.08. With increasing weight fraction $w_1$ of solvent in
the initial solution, the heat of dilution decreased, becoming zero at
$w_1 = 0.7 - 0.8$ but in the system polyisobutylene - toluene was already $w_1$, 0.55.
The integral heat of solution was calculated from : $-\Delta H = (Q - q)w_2$, where
$Q$ is the integral heat of solution for 1 g polymer in a large quantity of
solvent, q the integral heat of dilution for 1 g polymer, and $w_2$ the con-
centration of polymer in parts by weight. The differential heat of solution
$\Delta\overline{H}_1$ and the differential heat of dilution $\Delta\overline{H}_2$ were determined from the
dependence of the integral heat of solution on the composition of the solu-
tion (Fig. 6). The curves $\Delta H = f(w_2)$ and $\Delta\overline{H}_i = f(w_2)$ for polymers have the
same character as for low-molecular substances. The equation $\Delta\overline{E}_1$
$= [T_2 \Delta\overline{Z}_1(T_1) - T_1 \Delta\overline{Z}_1(T_2)]/(T_2 - T_1)$ used by C. E. H. Bawn, M. A. Walid

Card 2/3

Concentrated polymer...

S/190/63/005/001/012/020
B101/B186

(J. Polymer Sci., 12, 109, 1954) does not allow for the temperature dependence of the heat of solution, especially between 20 - 70°C, which leads to incorrect results. There are 6 figures and 1 table.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED:    July 19, 1961

Fig. 6. Dependence of the differential heat of solution, $\Delta \bar{H}_1$, and the differential heat of dilution, $\Delta \bar{H}_2$, on the composition of the solution. ($a$) polyisobutylene - toluene; ($\delta$) polyisobutylene - $CCl_4$; ($\delta$) polystyrene - $CCl_4$; (1) $\Delta \bar{H}_1$; (2) $\Delta \bar{H}_2$, cal/g. Card 3/3
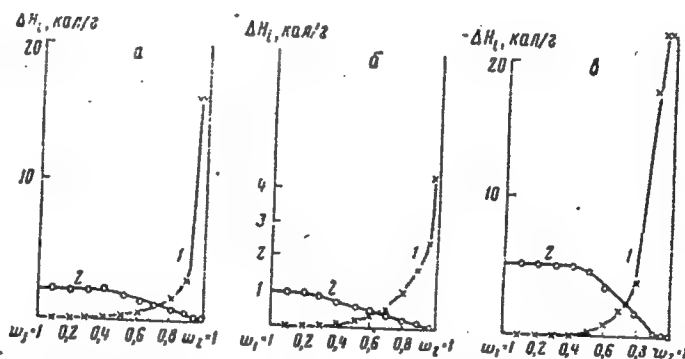
44270

S/190/63/005/001/013/020
B101/B186

AUTHORS:      Tager, A. A., Tsilipotkina, M. V., Dreval', V. Ye.,
              Nechayeva, O. V.

TITLE:        Concentrated polymer solutions. II.  Thermodynamic study of
              polyisobutylene solutions in various solvents

PERIODICAL:   Vysokomolekulyarnyye soyedineniya, v. 5, no. 1, 1963, 94 - 99

TEXT:  The 25°C isotherms were plotted for the sorption of $CCl_4$, toluene,
cyclohexane, butyl propionate, and methanol vapors by polyisobutylene having
the molecular weight $1.99 \cdot 10^6$.  Intense adsorption was found for $CCl_4$,
toluene, and cyclohexane vapors, weaker adsorption for butyl propionate
vapor, and no adsorption at all for methanol vapor. The properties of
polymer solutions can be compared only if the concentration is given in
molar parts or parts by volume, not if it is in parts by weight. The curve
$\Delta \mu_1$ versus concentration in molar parts also confirmed that toluene, $CCl_4$,
and cyclohexane were better solvents for polyisobutylene than butyl pro-
pionate.  $\Delta \mu_1$ is the difference of chemical potentials; it was calculated
Card 1/3

Concentrated polymer...

from: $\Delta\mu_1 = 2.303RT \log(P/P_s)$, where $P_s$ is the saturation pressure. The curves for the mixing entropy, $T\Delta S$, versus concentration, $\varphi_2$, in parts by volume, were plotted for polyisobutylene dissolved in toluene, $CCl_4$, cyclohexane, and isooctane. The equation found by Miller (G. Gee, Chemistry of Large Molecules) shows optimum agreement with the experimental values only in the case of the polyisobutylene - isooctane system, which is in accordance with the Flory-Huggins theory, holding for athermal systems only. In other solvents, however, a different value of $T\Delta S$ is observed for the same $\varphi_2$, i.e., the polyisobutylene chains have varying configuration numbers. $T\Delta S$, $\Delta H$, and $\Delta G$ were calculated according to Gibbs-Duhem, and the curves $T\Delta S = f(\varphi_2)$, $\Delta G = f(\varphi_2)$, $\Delta H = f(\varphi_2)$ were plotted. They show the following maxima (in cal/mole): in toluene with $\varphi_2 \sim 0.7$, $T\Delta S_{max} \sim 220$, $\Delta H_{max} \sim 115$; $\Delta G_{max} \sim -120$; in $CCl_4$ with $\varphi_2 \sim 0.6$, $T\Delta S_{max} \sim 130$, $\Delta H_{max} \sim 40$, $\Delta G_{max} \sim -100$; in cyclohexane with $\varphi_2 \sim 0.5$, $T\Delta S_{max} \sim 100$, $\Delta H_{max} \sim 0$, $\Delta G_{max} \sim -80$. The positive values of $\Delta H$ show that polyisobutylene is dissolved with great

Card 2/3

Concentrated polymer...

S/190/63/005/001/013/020
B101/B186

variation of entropy.  The low affinity of polyisobutylene to benzene, and the poor affinity to butyl propionate, may be due to the fact that $T \Delta S \approx \Delta H$, or $T \Delta S < \Delta H$.  There are 5 figures.  The most important English-language reference is:  C. E. H. Bawn, M. A. Walid, J. Polymer Sci., 12, 109, 1954.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
            (Ural State University imeni A. M. Gor'kiy)

SUBMITTED:   July 20, 1961

Card 3/3

S/190/63/005/003/021/024
B101/B203

AUTHORS:    Tager, A. A., Dreval', V. Ye., Khasina, F. A.

TITLE:    Concentrated polymer solutions. III. Viscosity of polyiso-
butylene solutions in various solvents

PERIODICAL:    Vysokomolekulyarnyye soyedineniya, v. 5, no. 3, 1963, 432-439

TEXT: The viscosity of polyisobutylene solutions of molecular weight
$1.2 \cdot 10^6$ in isooctane, toluene, butyl propionate, cyclohexane, decalin, and
carbon tetrachloride was determined at 20-50°C in concentrations of 0-100%,
and the activation heat of the viscous flow was calculated for the solu-
tions in toluene, isooctane, carbon tetrachloride, and cyclohexane.
Results: The greatest differences between the $\eta$-values in the various
solvents are observed at concentrations between 0.005 and 0.1 parts by
weight. At higher concentrations these differences become smaller but do
not disappear. There is no relationship between the viscosity of the solu-
tion and the affinity of polyisobutylene to the solvent. The viscosity
depends on the viscosity of the pure solvent and on the flexibility of the
polymer chain in this solvent. The viscosity of the solution decreases
with decreasing viscosity of the pure solvent and increasing flexibility of
Card 1/2

Concentrated polymer solutions...

S/190/63/005/003/021/024
B101/B203

the chain. The higher the viscosity the higher the activation heat; this
does not depend directly on the energy of interaction between polymer and
solvent but on the size of the segment, i.e. on the flexibility of the
polymer chain. There are 4 figures and 1 table.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
(Ural State University imeni A. M. Gor'kiy)

SUBMITTED: October 2, 1961

Card 2/2

TAGER, A.A.; DREVAL', V.Ye.; TRAYANOVA, N.G.

Effect of the molecular weight of polyisobutylene on the viscosity
and heat of activation of its concentrated solutions.   Dokl. AN
SSSR   151   no.1:140-143   Jl   '63.                    (MIRA 16:9)

1. Predstavleno akademikom V.A.Karginym.
                              (Polypropylene)

L 40009-65    EWT(m)/EPF(c)/EWP(v)/EPR/EWP(j)/T    Pc-4/Pr-4/Ps-4    RM/WW/GS

ACCESSION NR:   AT4049839                  S/0000/64/000/000/0023/0027

AUTHOR:  Kuleznev, V. N.; Tager, A. A.; Letunova, T. I.

TITLE:  Investigation of the effect of oxidation-reduction systems on polymers in solution

SOURCE:  Khimicheskiye svoystva i modifikatsiya polimerov (Chemical properties and the modification of polymers); sbornik statey. Moscow, Izd-vo Nauka, 1964, 23-27

TOPIC TAGS:  oxidation reduction system, polychloroprene rubber, butadiene rubber, polymer solution, rubber crosslinking, vulcanization, polymer viscosity

ABSTRACT:  The authors investigated the effect of reversible and irreversible oxidation-reduction systems on the crosslinking of polychloroprene (PKhP) and butadiene (SKB) rubber in solution at room temperature and with a limited access of oxygen.  The experimental procedure is described in detail.  The change in viscosity of an SKB solution during vulcanization is plotted.  The time of cross-linking is plotted against the concentration of benzoyl peroxide, benzoin and iron stearate.  For both rubbers, crosslinking time decreases with increasing con-centration of the components.  Crosslinking time is longer for PKhP than for SKB in all cases; in dichloroethane, PKhP is crosslinked much more slowly than in

Card    1/2

L 40009-65

ACCESSION NR:  AT4049839                                                        2

benzene.  The time of crosslinking is affected to a certain extent by the nature
of the iron salt residue; iron stearate is more active than the oleate.  Cross-
linking of PKhP under the influence of reversible redox systems shows that not
only 1,2-bonds participate in the chemical reactions but also 1,4-bonds.  Iron
stearate has an inhibitory effect on PKhP at a concentration of 40 mol.% stearate,
and for SKB at 15 mol.%.  It was found that irreversible systems do not have a
crosslinking effect under these conditions.  Introduction of the irreversible re-
dox system benzoyl peroxide-iron stearate-benzoin causes the viscosity of the
solution and gel formation to increase considerably.  In the case of a limited
access  of oxygen, only the reversible redox systems have an effective cross-
linking effect.  Tabulated data on the effect of previous processing on cross-
linking show that the time of crosslinking for SKB previously rolled is longer
than for unrolled rubber.  Gels from solutions of extracted SKB have a less dense
structure than gels from ordinary SKB.  It is concluded on the basis of an experi-
ment on the adhesion of Nairit resin that the adhesive compositions containing
reversible redox systems can be used in practice for bonding rubbers in the cold.
Orig. art. has:  4 figures and 2 tables.

ASSOCIATION:  Ural'skiy gosudarstvennyy universitet im. A.M. Gor'kogo (Ural
state university)

Card  2/3          Submitted  12 MAY 62

TAGER, A.A.; DREVAL', V.Ye.; KHISAMOVA, L.A.

Viscosity of critical mixtures polymer - low molecular liquid. Vysokom.
soed. 4 no.9:1593-1599 S '62.                    (MIRA 17:10)

1. Ural'skiy gosudarstvennyy universitet imeni Gor'kogo.

L 61726-65   EWT(m)/EPF(c)/EWP(j)/EWA(c)   Pc-4/Pr-4/Ps-4 . RPL   WW/RM
ACCESSION NR:  AP5013062                    UR/0190/65/007/005/0891/0897
                                            678.01:53+678.664                    33
                                                                                30
AUTHORS:  Karas', L. Ya.; Tager, A. A.                               7           B

TITLE:  The mechanical properties of three-dimensional polyurethanes prepared on
the basis of polydiethylene-succinate, polydiethyleneadipate, and polydiethylene-
sebacate.  1st communication in the series "Influence of the chemical nature of
the chain and degree of cross-linkage on the properties of polyurethanes"

SOURCE:  Vysokomolekulyarnyye soyedineniya, v. 7, no. 5, 1965, 891-897

TOPIC TAGS:  polymer, resin, polyurethane plastic, tensile stress, tensile
strength, polyethylene

ABSTRACT:  Physical properties of polyurethanes were determined in order to clar-
ify existing discrepancies in the literature regarding the effect of cross-linkage
network density on the mechanical and other properties of three-dimensional poly-
urethanes of different chemical natures.  The mechanical properties of poly-
urethanes prepared on the basis of polyethylene-succinate, polyethylene-adipate
and polyethylene-sebacate in the presence of trimethylpropane were studied.  The
degree of cross-linkage was determined by adjusting the concentration of

Card 1/2

L 61726-65

3

ACCESSION NR: AP5013062

trimethylpropane. The reactions were carried out at 120C. It was found that the mechanical properties of the polyurethane depend on the chemical nature of the polyurethane and the degree of cross-linkage. Increase in the degree of cross-linkage causes a drastic decrease in the strength of the polymer but has little effect on the glass temperature. The tensile strength of polyurethanes when ex-pressed on a function of the degree of cross-linkage has a maximum, the nature and magnitude of which is determined by the ease of crystallization of the poly-urethane. Aging increases the tensile strength of polyethylene-sebacate. It is concluded that, since the curves of tensile strength versus degree of cross-linkage intersect for different polyurethanes, the mechanical properties of the latter must be investigated over wide regions of cross-linkage before their suit-ability for a particular industrial application can be assessed. Zh. D. Timoshenko and R. S. Shcheglova participated in the experimental part of the investigation. Orig. art. has: 2 tables and 6 graphs.
ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. Gor'kogo (Ural State University)

SUBMITTED: 21Jul64          ENCL: 00                SUB CODE: MT, GC

NO REF SOV: 003             OTHER: 009

*aww*
Card 2/2

L 18572-66   EWT(m)/EWP(j)/T/ETC(m)-6    WW/JW/JWD/RM

ACC NR: AP6002432                    SOURCE CODE: UR/0020/65/165/005/1122/1125

AUTHORS: Tager, A. A.; Karas', L. Ya.

ORG: none

TITLE: Thermodynamics of swelling of three-dimensional polyurethanes

SOURCE: AN SSSR. Doklady, v. 165, no. 5, 1965, 1122-1125

TOPIC TAGS: polymer, polyurethane, thermodynamic analysis, thermodynamic function, thermodynamic property

ABSTRACT: The sorbtion isotherms for the sorbtion of dioxane on a number of polyurethanes and also the entropy and enthalpy of mixing polyurethanes in dioxane solutions were determined. The sorbtion experiments were carried out by the method of A. A. Tager and V. A. Kargin (Koll. zhurn., 10, 455, 1948) and the solution experiments by the method of A. A. Tager (Fiziko-khimiya polimerov, M., 1963. str. 380). The experimental results are presented in graphs and tables (see Fig. 1). It is concluded that the flexibility of the polyurethane chains increases with increase in the number of methyl groups between the complex ester linkages. This paper was presented by Academician V. A. Kargin on 15 May 1965.

Card 1/2                                                    UDC: 678.03:53+678.664

L 18572-66
ACC NR: AP6002432
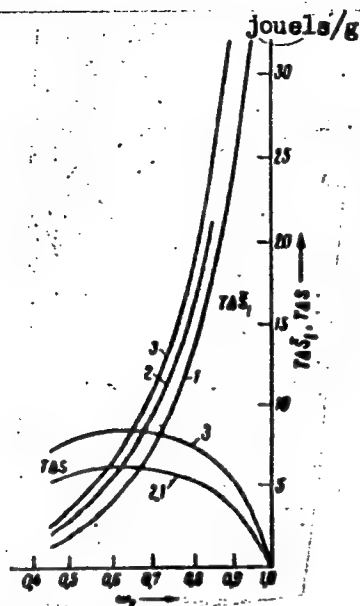


Fig. 1. Dependence of the entropy of mixing on the composition of the solution. 1 - polyurethane succinate, 2 - polyurethane adipinate (B-1), 3 - polyurethane sebacinate.

Orig. art. has: 1 table and 3 graphs.

SUB CODE: 11, 07/SUBM DATE: 15May65/    ORIG REF: 009/    OTH REF: 001

Card 2/2

TAGER, A.A.; MY-AKIOW, D.V.; POLONSKAYA, V.V.; FEDOROVA, L.M.; DUL'TSEVA, L.D.

Fundamentals of investment casting. Lit. prolzv. no.9:36-39 S '64.
(MIRA 18:10)

CHULANOV, V.N.; STESHENKO, Ye.M.; TAGER, A.R.

Operation of the cement works of an aluminum factory.   TSement 27
no. 2:8-10 Mr-Ap '61.                                 (MIRA 14:5)
                    (Dust—Removal)    (Cement plants)

VIROTCHENKO, I.I.; KOKAR', I.N.; TAGER, A.R.

Soundproofing a mill.  TSement 28 no.3:19-20 My-Je '62.
(MIRA 15:7)

1.  Volkhovskiy alyuminiyevyy zavod.
(Milling machinery--Soundproofing)
(Cement plants--Equipment and supplies)

9.1300
9.2585

: 7222
S/...8/60/...0/..11/7.4/..
A: 1/43 1

Translation from: Referativnyy zhurnal, Fizika, 1960, No. 11, p. 514, # 30752

AUTHORS:     Solntsev, V.A , Tager, A.S.

TITLE:       Electronic Waves in a Periodic Electrostatic Field and Their Interaction With the Field of Waveguide Systems

PERIODICAL:  Tr. Konferentsii po elektronike 5-th, 1957, Moscow-Leningrad, Gosenergoizdat, 1959, pp. 112-133

TEXT:        The propagation of a weak high-frequency signal in a rectilinear electronic flux with the velocity of electrons varying periodically along the beam was theoretically studied. Space harmonics of the current are considered, conditions of increasing their amplitudes are obtained at the motion of the beam in free space. The interaction of current harmonics with the electromagnetic field of the waveguide system was studied by the methods of the weak signaltheory. The analysis was performed with allowance for the reverse effect of a HF field on the electronic beam. It is shown that an effective interaction of the electronic beam with the fast waves of the waveguide system can be brought about at certain relations between the velocity of electrons and the period of its variation. The

Card 1/2

3-222

S 156.60.001,01......17
A0017401

Electronic Waves in a Periodic Electrostatic Field and Their Interaction With the
Field of Waveguide Systems

effectiveness of such a device (electrostatic undulator) was compared, within the
framework of the linear theory, with the effectiveness of the instrument of ЛБВ
(LBV) or ЛОБ (LOV) type; it is shown that the non-relativistic undulator does
not yield a gain in maximum frequency  Conditions are specified under which an
employment of periodic electrostatic focusing in LBV does not result in deteriora-
tion of their characteristics

A.S. Pager

Translator's note  This is the full translation of the original Russian abstract.

Card 2/2

PA - 2578

AUTHOR      TAGER, A.S.
TITLE       Research on noise property of travelling wave valves.
            (Issledovaniye shumovykh svoystv lamp s befushchey volnoy.Russian)

PERIODICAL  Radiotekhnika i Elektronika, 1957, Vol2, Nr 2, pp 222-229
            (U.S.S.R.)
            Received  4/1957                        Reviewed 6/1957

ABSTRACT     The lecture was delivered in 1956 at the International High
            Frequency-Electronic Congress in Paris. It is shown that, with
            the primary fluctuations resulting from excitation of the waves
             of the space charge of higher type which are not in correlation
            with the ground wave being taken into arrount, the minimum coef-
            ficient of the noise of travelling wave valves in the case of
            oversaturation of the cathode, considerably exceeds 6 db. This is
            carried out by a method which is analogous to that of J.Pierce
            (Proc. IRE, 1952, 4o, 12, 1675-168o). The difference consists
            in the fact that here a threedimensional problem is dealt with,
            that the charge of the electron is assumed to be punctiform, and
            the excitation in the bundle of waves of a higher type of space
            charge is taken into consideration. The characteristics of the
            noise of travelling wave valves were investigated experimental-
            ly on valves with a movable electron gun. The relations are gi-
            ven between the coefficient of noise of travelling wave valves and
            the distance between the electron gun and the befinning of the
            spiral of deceleration as well as between this coefficient and

Card 1/2

Research on noise property of travelling wave valves. PA -2578

the velocity of the electrons in this space, the bundle-current, the potential relation of gun electrodes, the focussing magnetic field, and the mode of operation of the cathode. Experimental data are compared with theoretical data and the correctness of the claim that the space charge near the cathode plays an important part in the case of the depression of vortex noise at superhigh frequencies, is confirmed.
( 7 ill. and 1 citation from a Slav Publication ).

ASSOCIATION
PRESENTED BY
SUBMITTED    8/1956
AVAILABLE    Library of Congress
Card 2/2

SOV/109-3-3-22/23

SUBMITTED: December 7, 1957

AUTHORS: Golubkov, P.V. and Meiring, Sh. Ye.

TITLE: The Second All-Union Conference on Radioelectronics of the Ministry of Higher Education of the USSR (Vtoraya vsesoyuznaya konferentsiya MVO SSSR po radioelektronike) - News Item

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 3, pp 440 - 444 (USSR)

ABSTRACT: The conference took place during September 23 - 29, 1957, at Saratovskiy gosudarstvennyy universitet imeni N.G. Chernyshevskogo (Saratov State University imeni N.G. Chernyshevskiy). Apart from the universities, the conference was attended by the representatives of some scientific research institutes of the Soviet and Ukrainian Academies of Science, various industrial establishments and the interested ministries. This arrangement stimulated the discussion and permitted the determination of plans for the future research to be carried out by the universities in the field of radioelectronics.

"Comparison of the Efficiency of Certain Methods of Generation of Millimetre Waves" by A.S. Tager and

"Application of the Higher Spatial Harmonics of the Electro-magnetic Field in Slowing-down Systems" by A.S. Tager and V.I. Solntsev.

A number of the papers in the Electrodynamics Section dealt with the complex phenomena appearing at the junctions of waveguides. Here, it is necessary to mention the papers: "The Calculation of Junctions" by V.M. Surovax;

24(3)
AUTHORS:        Tager, A. S., Gladun, A. D.            SOV/56-35-3-49/61

TITLE:          On the Use of Cyclotron Resonance in Semiconductors for the
                Amplification and Production of Superhigh-Frequency Oscil-
                lations  (Ob izpol'zovanii tsiklotronnogo rezonansa v
                poluprovodnikakh dlya usileniya i generirovaniya
                sverkhvysokochastotnykh kolebaniy)

ABSTRACT:       In the cyclotron resonance in some semiconductors (as e.g.
                in Ge, Si) it was found that, in addition to the base lines
                of absorption, lines occur on such frequencies as are
                multiples of the cyclotron fundamental frequency.  This
                effect is connected with the non-harmonic character of the
                motion of the holes.  This phenomenon is suited for the
                production of regenerative amplifiers of generators of
                superhigh frequencies.  In this connection, the following
                scheme is, for example, possible:  The high-frequency
                electric "pumping field" (pole nakachka) $E_H$ with the

                frequency $\omega_H = n\omega_{cyclotron} = neH_0/m^* c$ $(n = 1,2,3...)$ acts

Card 1/3

On the Use of Cyclotron Resonance in Semiconductors     SOV/56-35-3-49/61
for the Amplification and Production of Superhigh-
Frequency Oscillations

upon a semiconductor located in a constant magnetic field $H_o$. Here $m^*$ denotes the effective mass of an electron $(m_e^*)$ or hole $(m_h^*)$. The aforementioned electric field acts in the plane which is vertical to $H_o$. If the field $E_H$ is sufficiently strong, oscillations can be excited in the system on the frequencies $\omega_c = l\omega_H/n = l\omega_{cyclotron}$, $l = 1,2,..$ These frequencies may be higher or lower than the "pumping frequency". The excitation of such oscillations is facilitated by such a position of the semiconductor in the resonator for which $\omega_H$ and $\omega_c$ are eigenfrequencies. An important advantage offered by cyclotron-resonance when compared to paramagnetic resonance is the possibility of making use of shortwave bands of superhigh frequencies (millimeters and submillimeters). Finally, a method of amplifying or transforming the frequency of oscillations is given for the case in which the non-harmonic character of cyclotron oscillations of the carriers is only weak or

Card 2/3

On the Use of Cyclotron Resonance in Semiconductors     SOV/56-35-3-49/61
for the Amplification and Production of Superhigh-
Frequency Oscillations

             non-existant.  There are 5 references, 1 of which is Soviet.

SUBMITTED:    June 17, 1958

Card 3/3

$04714$
SOV/141-1-5-6-18/28

AUTHORS:     Solntsev, V.A. and Tager, A.S.

TITLE:       Theory of the Interaction of Two Electron Beams Moving in a Periodic Electrostatic Field

PERIODICAL:  Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1958, Vol 1, Nr 5-6, pp 127 - 158 (USSR)

ABSTRACT:    The problem discussed was partly investigated by the authors in two earlier works (Refs 1 and 2). The analysis given is carried out under the following assumptions: 1) the electron trajectories are rectilinear; 2) the constant component of the electron space charge is compensated by ions; 3) the excitation of the higher-order space charge waves in the beam is neglected and, 4) both beams are of the single-velocity type. The two electron beams are fully intermixed and move along the axis $z$ with velocities $v^{(1)}(z)$ and $v^{(2)}(z)$; the velocities change with a period $L$. This change of velocities can be secured by employing a periodic electrostatic field. The equations of the high frequency components of the current

Card1/5

Theory of the Interaction of Two Electron Beams Moving in a Periodic
Electrostatic Field

densities $i^{(1)}$ and $i^{(2)}$ in the two beams are described
by (see Refs 1 and 2):

$$\frac{d^2 i^{(1,2)}}{dz^2} + 2j\frac{\omega}{v^{(1,2)}}\frac{di^{(1,2)}}{dz} - \frac{\omega^2}{(v^{(1,2)})^2}i^{(1,2)} +$$

$$+\frac{1}{v^{(1,2)}}\frac{dv^{(1,2)}}{dz}\left(2j\frac{\omega}{v^{(1,2)}}i^{(1,2)} + 3\frac{di^{(1,2)}}{dz}\right) = \frac{j\omega J^{(1,2)}\eta}{(v^{(1,2)})^3}E(z) \tag{4}$$

where $E(z)$ is the longitudinal component of the high-
frequency field, $J$ is the constant component of the
current density and $\eta = e/m$. The solution of Eq (4)
is in the form of Eq (6), where $\gamma$ denotes the propagation
constant for the zero space harmonic of the current. By
introducing new variables, defined by Eq (7), Eq (4) can be

Card2/5

66470
SOV/141-1-5-6-18/28

Theory of the Interaction of Two Electron Beams Moving in a Periodic
Electrostatic Field

written as Eq (8). The integration of this leads to
Eq (9). The solution of this is in the form of Eq (10).
On the other hand Eq (6) may be written as Eq (11).
Now, Eq (9) can be solved in terms of the series defined
by Eqs (12) and (13) where $\Gamma_k$ and $\bar{a}_k$ are given by

Eqs (13a) and (13b). By substituting the series of Eqs (11)
and (13) into Eq (9) and carrying out the integration, an
infinite system of linear algebraic equations is obtained.
These relate the amplitudes $c_n^{(1)}$ and $c_n^{(2)}$ and are given

by Eqs (15). If the system is to give significant solutions,
its determinant should be equal to zero, as defined by
Eq (16). This represents a general equation of the
dispersion of two intermixed electron beams. If the space
charge is comparatively small, the system obeys Eqs (18)
and (19). The dispersion equation is, therefore, given
by Eq (20). If the average plasma frequencies of the waves
in the beams are equal, Eq (20) is represented by Eq (22);
the solution of this is in the form of Eq (23). The solution

Card3/5

63474
SOV/141-1-5-6-18/28

Theory of the Interaction of Two Electron Beams Moving in a Periodic
Electrostatic Field

is plotted in Figure 2 for various values of $a_{-k}$. The
relative width of the interaction bands is given by
Eq (24a). On the other hand, the maximum amplification
in db per unit length of the beam is expressed by
Eq (26a). Eqs (24) and (26) show that the efficiency of
the interaction of the electron beams depends on the
coefficients $a_k$. It is shown in the appendix to the
paper that the coefficient $a_k$, for a system with sinusoi-
dally varying electrostatic potential, is given by Eq (28),
where $\varphi_S$ is defined by Eq (29). On the other hand, for
an electrostatic system with a stepwise change of the
potential (Figure 4), $a_k$ is given by Eq (30), where
$\varphi_c$ is defined by Eq (31). The dependence of $a_k$ on $\varphi_c$
is illustrated in Figure 5. Normally, the spread of the
electron velocities (which was not taken into account in
the above analysis) has a considerable influence on the

Card4/5

CONT

SOV/141-1 5-6-18/28

Theory of the Interaction of Two Electron Beams Moving in a Periodic
Electrostatic Field

characteristics of a two-beam tube    This effect can be
evaluated approximately (M.I. Rodak - Ref 6)    The electron
velocity distribution function is given by Eq (32), where
N denotes the density of the electrons, while $v_T$ is a
parameter characterising the spread of the electron
velocities.    The dispersion equation for $v_T$ can be
written as Eq (33).    On the basis of the above analysis.
it is concluded that the introduction of a periodic change
in the velocity of the electrons in a two-beam tube leads
to the appearance of the higher-order interaction regions;
these regions lie in the vicinity of the frequencies which
are practically independent of the magnitude of the space
charge of the beam    There are 5 figures and 7 references,
of which 3 are English and 4 Soviet.

SUBMITTED:    May 12, 1958

Card 5/5

BASHER, A. S.   (Moscow)  and FAYN, V. M.

"Spontaneous Radiation of a Particle System, Whose Dimensions Are Comparable to the Wave Length".

report presented at the All-Union Conference on Statistical Radio Physics, Gor'kiy, 13-18 October 1958.  (Izv. vyssh uchev zaved-Radiotekh., vol. 2, No. 1, pp 121-127)    COMPLETE card under SIFOROV, V. I.)

TAGER, A.S.; GLADUN, A.D.

Use of cyclotron resonance in semiconductors for the amplification
and generation of superhigh-frequency oscillations. Zhur. eksp. i
teor. fiz. 35 no.3:808-809 S '58.　　　　　　(MIRA 12:3)
　　　　　　　(Semiconductors)　(Oscillations)

М. Б. Галант.
А. С. Тагер
О методике работы параметрических усилителей СВЧ, в которых используются методы снобщных волн

Э. О. Салман
О предельных параметрах мощных электронных приборов миллиметрового диапазона

**9 июня**
(с 18 до 22 часов)

А. Л. Власов
О учете граничной частоты в теории электронных пучков

Г. А. Зайцевов
О взаимодействии электронного потока с электромагнитным полем

М. Б. Галант
Метод расчета параметров электронно-лучевых СВЧ генераторов перевозбуждаемого типа

Л. Н. Лошаков,
Ю. Н. Пчельников
Об определении коэффициента управления для постоянных распространения в замедленной системе при наличии электронного пучка

92

А. В. Гапонов
Взаимодействие электромагнитных волн с нерелятивистскими электронными потоками

**10 июня**
(с 10 до 16 часов)

А. И. Терещенко,
В. А. Коробанов
О возможности улучшения параметров резонаторной системы магнетрона посредством изменения формы резонаторов

М. И. Кузнецов,
Л. В. Рыбакова
К вопросу о методике флуктуаций в магнетроне

М. И. Кузнецов,
М. И. Барбасов,
В. Е. Нечаев
Экспериментальное исследование флуктуаций в магнетроне

М. М. Блейвас,
В. Н. Мистюкова,
В. Б. Хомич
Малогабаритный траектограф для решения уравнений движения заряженных частиц в электрических и магнитных полях

93

М. А. Миллер
Ускорение сгруппированных электромагнитных
пространственных полей

10 июня
(с 18 до 22 часов)

Д. М. Воскресенский,
Р. А. Грановская
Идеализованные системы в виде спиральной замедляю-
щей ЛБВ

С. Г. Константинов
Отклоняющие системы с бегущей волной

М. М. Блейвас,
Н. Н. Галкинов,
Н. М. Кальянов,
В. Н. Местечкин
Исследование электронных сигналов в пространстве
взаимодействия приборов СВЧ с учетом автомата
для измерения траекторий переменных частот

Г. А. Матузов,
Е. Д. Нефедов
Замедляющая цепь типа фильтра для мощных ЛБВ
с бегущей волной деционтрового диапазона

34

11 июня
(с 10 до 16 часов)

Совместное заседание с секцией ферритовых
устройств СВЧ

В. И. Зубков, М. С. Моносов
Некоторые вопросы теории параметрических усили-
телей

В. П. Тычинский
К теории ферритового усилителя

В. П. Тычинский,
Ю. У. Дерюх,
В. В. Короченцев
Экспериментальное исследование ферритового уси-
лителя

А. Л. Микаэлян,
М. Л. Швери
Некоторые результаты исследования ферритовых
усилителей

А. С. Тагер
К теории параметрических усилителей в волновод-
ных системах

35

М. Л. Штейн,
Л. М. Шейтман

О синтезе одного класса схем на ферритотронных структурных элементах

**15. СЕКЦИЯ ФЕРРИТОВЫХ УСТРОЙСТВ СВЧ**

Руководитель А. Л. Микаэлян

**11 июня**
(с 10 до 16 часов)

Совместное заседание с секцией электроники

В. И. Зубков,
М. С. Моносов

Некоторые вопросы теории параметрических усилителей

В. П. Титовский

К теории ферритового усилителя

В. П. Титовский,
Ю. Т. Дурнов,
В. В. Коротков

Экспериментальное исследование ферритового усилителя

А. Л. Микаэлян,
И. Л. Шварц

Некоторые результаты исследования ферритовых усилителей

А. С. Тагер

К теории параметрического усиления в волноводных системах

**11 июня**
(с 18 до 22 часов)

А. А. Постельмарс,
Сиб-Йен-Шень

Колебания малой ферритовой сферы в поле плоской волны

А. Л. Микаэлян,
В. Ф. Автономов

Смешение сверхвысоких частот в феррите

А. Л. Микаэлян,
А. К. Столяров

О ферритовых вентилях предельного типа

А. Л. Микаэлян,
Н. Г. Тойголдберг

Применение феррита для управления частотой электромагнитных волн

PHASE 1 BOOK EXPLOITATION                SOV/5292

Konferentsiya po elektronike sverkhvysokoy chastoty

Trudy (Transactions of the Conference on Superhigh-Frequency Electronics) Moscow, Gosenergoizdat, 1959.  271 p.  3,500 copies printed.

Sponsoring Agency:  Vsesoyuznyy nauchnyy sovet po radiofizike i radiotekhnike AN SSSR.

Eds. (Title page):  I. S. Dzhigit, Professor, and Ye. G. Solov'yev, Candidate of Technical Sciences; Ed.: S. Akalunin; Tech. Ed.: G. Ye. Larionov.

PURPOSE:  This book is intended for scientific and technical personnel concerned with the development and operation of superhigh-frequency devices.

COVERAGE:  The book contains a number of papers dealing with the more important problems of superhigh-frequency electronics. The papers were submitted at the Conference on Electronics called by the Vsesoyuznyy nauchnyy sovet po radiofizike i radiotekhnike AN SSSR (All-Union Scientific Council for Radiophysics and Radio Engineering, AS USSR) and the Byuro novoy tekhniki MO SSSR (Bureau of Modern Engineering, Ministry of Defense, USSR) and held in Moscow in 1957. The reports deal with the following topics: problems of the theory and calculation of the delay systems of traveling-wave and backward-wave tubes; certain phenomena occurring in a cylindrical electron beam finding itself in a uniform magnetic field; the focusing of long beams by means of periodic magnetic and electric fields; and some problems concerning reflex klystrons. Modern types of cathodes for superhigh-frequency devices are described. No personalities are mentioned.  References accompany most of the reports.

06340
SOV/141-2-1-12/19

AUTHORS     Solntsev, V.A. and Tager, A.S.

TITLE:      Periodic Interaction of Electron Streams

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika,
            1959, Vol 2, Nr 1, pp 101 - 110 (USSR)

ABSTRACT:   It is shown that where interaction takes place, non-
            evanescent processes occur not only in the fundamental
            band but also in narrow, higher-frequency intervals.
            The effect is independent of current density but is
            limited by dispersion in electron velocity. Previous
            analyses have most often been concerned with two electron
            streams having different, constant velocities. The forms
            of interaction studied here are shown in Figure 1. In
            the first three variants, parameters of the electron stream
            change periodically; in Figure 1a, velocity; Figure 1б,
            stream diameter; Figure 1B, drift-tube diameter.
            In the structures of Figure 1Г the interaction is modi-
            fied by slots in a screen and in Figure 1Д by a
            "slalom" focusing arrangement. With continuous inter-
            action the maximum working frequency depends on plasma
            frequency and velocity dispersion as discussed in Ref 1
            (V.M. Lopukhin). The reason for the existence of discrete

Card 1/3

06340
SOV/141-2-1-12/19

Periodic Interaction of Electron Streams

bands of frequency in the interaction with a periodic
structure is best seen in the case of Figure 1r .
If the streams only interact over the length  of a slot
then the phase change of the faster space-charge wave
between one slot and the next must equal that of the
slower wave or differ from it by  $2\pi k$ , where  k  is
a whole number.  The simple formula quoted in Ref 1 then
becomes Eq (3).  An alternative viewpoint is that the
higher order bands arise from synchronism between, e.g.
the m-th spatial harmonic of the slower beam with the
n-th of the faster one.  If the relation between current
density and stream cross-section is Eq (8) and replacing
the high-frequency component of velocity, current density
and space charge by equivalent quantities in Eq (11), the
relation between equivalent current density and longitudinal
electric field is Eq (15).  The longitudinal electric fields
induced in one stream by current in another are Eq (16).
If thin  streams are considered, the expression  (A.6)
derived in the appendix allows for the reduction in the
axial component of Coulomb force in comparison with the

Card2/3

06340
SOV/141-2-1-12/19

Periodic Interaction of Electron Streams

case of a stream of infinite section. Using this 'depression coefficient' (A.6), the equivalent current densities are Eq (21) and the propagation constant is to be found from Eq (28). A simplified form of this latter expression is Eq (29) in terms of $R_k$, the interaction coefficient. The condition for amplification to occur is Eq (32). Values for $R_k$ are derived for particular cases: thin streams comparatively far apart, Eq (34); tubular streams – the expression to be found in the work of J.R. Pierce (Ref 6); plane streams separated by a periodic screen, Eq (36); the arrangement of Figure 1B, Eq (37).

There are 1 figure and 7 references, of which 4 are Soviet and 3 English.

SUBMITTED:    August 18, 1958

Card 3/3

9.1300

S/109/60/005/07/008/024
E140/E163

2/

AUTHORS:    Solntsev, V.A., and Tager, A.S.

TITLE:      Excitation of Waveguide Systems by an Electron Stream
            with Prescribed Modulation

PERIODICAL: Radiotekhnika i elektronika, Vol 5, No 7, 1960,
            pp 1100-1111 (USSR)

ABSTRACT:   In the majority of published work on the theory of
            waveguide excitation by prescribed currents, mono-
            chromatic currents with prescribed space distribution are
            considered.  The most general theory of monochromatic current
            excitation of waveguides is given by Vaynshteyn (Refs 1, 2).
            On the other hand, in the theory of the Cherenkov and Doppler
            effects in waveguide systems, the radiation of a point charge or
            an elementary electric dipole moving rectilinearly along the
            waveguide is considered.  The spectral density of the current
            connected with such a charge or dipole is constant over a very
            wide band of frequencies.  In real electron devices the current
            spectrum has a complex character and does not reduce to either of
            the cases considered.  The basic formulae obtained by the two
            methods differ from each other in principle.  The present work

Card 1/2